

Venus Express spacecraft observations with EVN radio telescopes (IPPW-7)

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ABSTRACT

The ESA Venus Express spacecraft was observed at X-band with several European radio telescopes, Metsähovi (Finland), Medicina (Italy), Noto (Italy), Matera (Italy), Yebes (Spain) Wettzell (Germany) and Pustchino (Russia), during a 2008-2010 observational campaign. The campaign was conducted in a framework of the assessment study of the possible contribution of the European VLBI Network (EVN) to the upcoming ESA deep space missions. The first goal of these observations was to develop and test the scheduling, data capture, transfer, processing and analysis pipeline. Observed data, recorded in VLBI-compatible mode using Mark5A, PCEVN and K5 recorders, were transferred from the radio telescopes to Metsähovi for processing with the ultra-high spectral resolution software spectrometer-correlator, and processed data from Metsähovi to JIVE for analysis. A turnover time of 12 hours from observations to analysis results was achieved. The high dynamic range of the detections allowed us to achieve a milli-Hz level of spectral resolution accuracy and to extract the phase of the spacecraft signal carrier line. Several physical parameters can be retrieved from these observational results, for instance, the influence of the Solar wind plasma on the accuracy of the astrometric VLBI observations of the planetary probes.

Here we report the technology aspects of our research and preliminary results obtained during several multi-station VLBI phase referencing observations of the Venus Express. Based on our measurements, we can conclude that, from the VLBI vantage point, the best landing interface time for Venus missions (EVE, Venera-D) is near a quadrature position of Venus, while for outer planets – Mars, Jupiter, Saturn (ExoMars, Phobos-Grunt, EJSM, TESM) – near the anti-solar point. This statement will be complemented when the scintillation index is measured in a nearer orbit to the Earth.